

92. (Amended) The computer program product according to claim 80, wherein said digital image is stored in a database of digital images and wherein said digital image can be retrieved using a icon representing a stereotype.

93. (Amended) The computer program product according to claim 80, wherein said digital image is stored in a database of digital images and wherein said digital image can be retrieved from said database using either a keyword or icon representing a generalisation, or broader version, of a stereotype.

REMARKS

This application has been reviewed in light of the Office Action dated May 24, 2002. Claims 1, 3-18, 20-35, 37-52, 54-66, 68-80, and 82-93 are presented for examination. Claims 2, 19, 36, 53, 67, and 81 have been canceled, without prejudice or disclaimer of the subject matter presented therein. Claims 1, 3-8, 18, 20-25, 27, 30, 34, 35, 37-42, 52, 54-60, 62-66, 68-74, 76-80, 82-88, and 90-93 have been amended to define more clearly what Applicant regards as her invention. Claims 1, 18, 35, 52, 66 and 80 are in independent form. Favorable reconsideration is requested.

Claims 4-9 were objected to as to informalities noted in paragraph 1 of the Office Action.

Applicant has carefully reviewed and amended Claims 4-9 to overcome the noted objections. It is believed that the objections to Claims 4-9 have been remedied, and withdrawal is therefore respectfully requested.

Claims 1-10, 18-27, 35-44, 52-61, 66-75, and 80-89 were rejected under 35 U.S.C. § 102(b) as being anticipated by "A Markov Random Field Model-Based Approach To Image Interpretation, IEEE Paper ISBN: 0162-8828 (*Modestino et al.*).

Claims 11, 17, 28, 34, 45, 51, 62-65, 76-79, and 90-93 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Modestino et al.* in view of U.S. Patent No. 5,930,783 (*Li et al.*). Claims 12-16, 29-33, and 46-50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Modestino et al.* further in view of *Li et al.* and U.S. Patent No. 6,360,234 (*Jain et al.*).

First, cancellation of Claims 2, 19, 36, 53, 67, and 81 renders their rejections moot.

As shown above, Applicant has amended independent Claims 1, 18, 35, 52, 66, and 80 in terms that more clearly define the present invention. Applicant submits that these amended independent claims, together with the remaining claims dependent thereon, are patentably distinct from the cited prior art for at least the following reasons.

The aspect of the present invention set forth in Claim 1 is a method of classifying a digital image. The method comprises the steps of segmenting the image into substantially homogeneous regions and processing the regions to provide a region adjacency graph for the digital image. The region adjacency graph represents adjacencies between the regions. The method also comprises the steps of analyzing the region adjacency graph for predetermined patterns of regions, and classifying the digital image as one of a plurality of stereotypes according to each identified pattern.

One important feature of Claim 1 is that the method classifies the digital image as one of a plurality of stereotypes according to each identified pattern.

Modestino et al., as understood by Applicant, discloses an image interpretation method based on a Markov Random Field (MRF) model. Apparently, in the *Modestino et al.* method, an image is segmented into a collection of disjoint regions that form the nodes of an adjacency graph. Object labels are assigned to the segmented regions using domain knowledge, extracted feature measurements, and spatial relationships between the various regions. The interpretation labels are modeled as an MRF on the corresponding adjacency graphs, and the image interpretation problem is then formulated as a maximum posteriori (MAP) estimation rule, given the domain knowledge and region based measurements. The domain knowledge is represented as clique functions. Simulated annealing is used to find the best realization or optimal MAP interpretation.

In making the rejection of dependent Claim 8, under 35 U.S.C. § 102(b), the Office Action states that *Modestino et al.* discloses that the stereotypes are represented in a hierarchical arrangement. However, Applicant submits that *Modestino et al.* in general and particularly at Fig. 1 and Table III (b) and IV (b), fails to disclose, teach or suggest the method as recited in Claim 1, of classifying a digital image as one of a plurality of stereotypes according to each identified pattern.

As described at page 14, lines 13 and 14 of the present specification, a stereotype is a higher level expression which can be used for the purposes of retrieval on a more generic basis than is provided by the use of semantic labels. Further, as described at page 15, lines 12-19, the generated stereotypes can form the basis of an image retrieval system where

images can be retrieved on the basis of stereotype name matching. The icons can be presented in the form of icon trees through which the user can navigate, where the icon trees represent the hierarchical arrangement of stereotypes. The user can select the icon representing the stereotype of the desired image(s), and a query can be generated for the request. As also described at page 16, lines 2-6, the stereotype icons provide a convenient means for formulating a query to an image (or video) database. Still further, the image retrieval system can be implemented without the costly requirement of manual annotation, since the stereotypes are automatically generated by a digital image or digital video interpretation system.

Accordingly, Applicant submits that Claim 1 is not anticipated by *Modestino et al.*, and respectfully request withdrawal of the rejection under 35 U.S.C. § 102(b).

Li et al., as understood by Applicant, relates to a computer implemented method for searching and retrieving images contained within a database of images in which both semantic and cognitive methodologies are utilized. The method accepts a semantic and cognitive description of an image to be searched from a user, and successively refines the search utilizing semantic and cognitive methodologies and then ranks the results for presentation to the user. Similarly, *Jain et al.*, as understood by Applicant, relates to a system and method for video cataloguing. The video is catalogued according to predefined user definable metadata. The metadata of *Jain et al.* is used to index and then retrieve encoded video.

In many cases users do not wish to retrieve images using specific constraints as described in *Li et al.* (e.g. finding all images where a person is to the left of a control tower). This is particularly true for graphic designers who are looking for an image to fit into a design or

presentation. In such situations, the present invention, as defined in Claim 1, can act as a filter, so that the designer can select the best image by browsing.

Applicant submits that neither *Li et al.*, *Jain et al.*, nor any combination thereof, added to the disclosure of *Modestino et al.*, discloses or suggests the method as recited in Claim 1, of classifying a digital image as one of a plurality of stereotypes according to each identified pattern.

Accordingly, Applicant submits that Claim 1 is believed to be in condition for allowance.

Independent Claims 18, 35, 52, 66, and 80 include the similar feature of classifying the digital image as one of a plurality of stereotypes according to each identified pattern, as discussed above in connection with Claim 1. Accordingly, Claims 18, 35, 52, 66, and 80 are believed to be patentable for reasons substantially similar to those discussed above in connection with Claim 1.

A review of the other art of record has failed to reveal anything which, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. These claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,


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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Amended) A method of classifying a digital image, said method comprising the steps of:

segmenting said image into substantially homogeneous regions;

[providing] processing said regions to provide a region adjacency graph

[representing] for the digital image, said region adjacency graph representing adjacencies

between said regions; [and]

analysing said region adjacency graph for predetermined patterns [and for each identified pattern selecting a classification of said digital image] of regions; and

classifying said digital image as one of a plurality of stereotypes according

to each identified pattern.

Claim 2 has been canceled.

3. (Amended) The method according to claim [2] 1, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of a size of one or more regions of said digital image.

4. (Amended) The method according to [any one of] claim 3, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of an adjacency of said regions.

5. (Amended) The method according to [anyone of] claim [4] 1, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of [its] semantic label content of said region adjacency graph.

6. (Amended) The method according to [anyone of] claim [4] 1, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of a mean colour of one or more regions of said region adjacency graph.

7. (Amended) The method according to [anyone of] claim [6] 1, wherein said plurality of stereotypes are stored in an association lookup table.

8. (Amended) The method according to claim [6] 1, wherein said stereotypes are represented in a hierarchal arrangement.

18. (Amended) An apparatus for classifying a digital image, said apparatus comprising:

segmenting means for segmenting said image into substantially homogeneous regions;

[providing means for providing] processing means for processing said regions to provide a region adjacency graph [representing] for the digital image, said region adjacency graph representing adjacencies between said regions; [and]

analysing means for analysing said region adjacency graph for predetermined patterns [and for each identified pattern selecting a classification of said digital image] of regions; and

classification means for classifying said digital image as one of a plurality of stereotypes according to each identified pattern.

Claim 19 has been canceled.

20. (Amended) The apparatus according to claim [19] 18, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of a size of one or more regions of said digital image.

21. (Amended) The apparatus according to claim 20, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of an adjacency of said regions.

22. (Amended) The apparatus according to claim [21] 18, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of [its] semantic label content of said region adjacency graph.

23. (Amended) The apparatus according to claim [21] 18, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of a mean colour of one or more regions of said digital image.

24. (Amended) The apparatus according to claim [23] 18, wherein said plurality of stereotypes are stored in an association lookup table.

25. (Amended) The apparatus according to claim [23] 18, wherein said stereotypes are represented in a hierarchal arrangement.

27. (Amended) The apparatus according to claim [26] 18, wherein said region adjacency graph is provided by analysing contextual data associated with one or more regions of said digital image.

30. (Amended) The apparatus according to claim [29] 18, further comprising metadata providing means for providing metadata associated with each digital image, wherein said metadata includes said stereotypes of each digital image.

34. (Amended) The apparatus according to Claim [33] 18, which said digital image is stored in a database of digital images and wherein said classification can be used to retrieve said digital image from said database.

35. (Amended) A computer program product comprising a computer readable medium having a computer program recorded for classifying a digital image, said computer program product comprising:

segmenting module for segmenting said image into substantially homogeneous regions;

[providing module for providing] processing module for processing said regions to provide a region adjacency graph [representing] for the digital image, said region adjacency graph representing adjacencies between said regions; [and]

analysing module for analysing said region adjacency graph for predetermined patterns [and for each identified pattern selecting a classification of said digital image] of regions; and

classification module for classifying said digital image as one of a plurality of stereotypes according to each identified pattern.

Claim 36 has been canceled.

37. (Amended) The computer program product according to claim [36] 35, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of a size of one or more regions of said digital image.

38. (Amended) The computer program product according to claim 37, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of an adjacency of said regions.

39. (Amended) The computer program product according to claim [38] 35, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of [its] semantic label content of said region adjacency graph.

40. (Amended) The computer program product according to claim [38] 35, wherein [a stereotype is assigned to a region adjacency graph] said digital image is classified on the basis of a mean colour of one or more regions of said digital image.

41. (Amended) The computer program product according to claim [40] 35, wherein said plurality of stereotypes are stored in an association lookup table.

42. (Amended) The computer program product according to claim [41] 35, wherein said stereotypes are represented in a hierarchal arrangement.

52. (Amended) A method of classifying a digital image signal, said method comprising the steps of:

segmenting said image into substantially homogeneous regions;

[providing a labelled] processing said regions to provide a labelled region adjacency [graph representing at least part of] graph [the digital image signal] comprising at least one semantic label and representing at least part of the digital image signal];

providing a plurality of stereotype classifications, for each of a plurality of patterns, wherein each said pattern comprises:

- (i) a set of labelled regions; or
- (ii) a set of labelled regions and corresponding adjacency

information;

analysing said labelled region adjacency graph for the presence of predetermined patterns; and

for each pattern identified, selecting from said plurality of classifications a stereotype classification for the digital image.

Claim 53 has been canceled.

54. (Amended) The method according to claim [53] 52, wherein [a stereotype is assigned to the digital image signal] said digital image is classified on the basis of [the] semantic label content of [one or more regions in the labelled] said region adjacency graph.

55. (Amended) The method according to claim [53] 52, wherein a stereotype is assigned to the digital image signal on the basis of the adjacency of a set of regions with specified labels in the labelled region adjacency graph.

56. (Amended) The method according to claim [53] 52, wherein a stereotype is assigned to the digital image signal on the basis of the size of one or more regions with a specified label in the labelled region adjacency graph.

57. (Amended) The method according to claim [53] 52, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents the mean colour of one or more regions in the labelled region adjacency graph.

58. (Amended) The method according to claim [53] 52, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents the mean colour texture of one or more regions in the labelled region adjacency graph.

59. (Amended) The method according to claim [58] 52, wherein said plurality of stereotypes are stored in an association lookup table.

60. (Amended) The method according to claim [59] 52, wherein said stereotypes are represented in an hierarchical arrangement.

62. (Amended) The method according to claims [61] 52, wherein each of said stereotypes is represented by one of a plurality of icons.

63. (Amended) The method according to claims [62] 52, where said digital image is stored in a database of digital images and wherein said digital image can be retrieved from said database using a keyword representing a stereotype.

64. (Amended) The method according to claim [62] 52, where said digital image is stored in a database of digital images and wherein said digital image can be retrieved from said database using an icon representing a stereotype.

65. (Amended) The method according to claim [62] 52, where said digital image is stored in a database of digital images and wherein said digital image can be retrieved from said database using either a keyword or icon representing a generalisation, or broader version, of a stereotype.

66. (Amended) An apparatus for classifying a digital image signal, said apparatus comprising:

segmenting means for segmenting said image into substantially homogeneous regions;

[region adjacency graph providing means for providing a labelled region adjacency graph] processing means for processing said regions to provide a labelled region adjacency graph comprising at least one semantic label and representing at least part of the digital image signal;

classification providing means for providing a plurality of stereotype classifications, for each of a plurality of patterns, wherein each said pattern comprises:

- (i) a set of labelled regions; or
- (ii) a set of labelled regions and corresponding adjacency

information; and

analysing means for analysing said labelled region adjacency graph for the presence of predetermined patterns, wherein for each pattern identified, said classification providing means provides a stereotype classification for the digital image selecting from said plurality of stereotype classifications.

Claim 67 has been canceled.

68. (Amended) The apparatus according to claim [67] 66, wherein a stereotype is assigned to the digital image signal on the basis of the semantic label content of one or more regions in the labelled region adjacency graph.

69. (Amended) The apparatus according to claim [67] 66, wherein a stereotype is assigned to the digital image signal on the basis of the adjacency of a set of regions with specified labels in the labelled region adjacency graph.

70. (Amended) The apparatus according to claim [67] 66, wherein a stereotype is assigned to the digital image signal on the basis of the size of one or more regions with a specified label in the labelled region adjacency graph.

71. (Amended) The apparatus according to claim [67] 66, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents the mean colour of one or more regions in the labelled region adjacency graph.

72. (Amended) The apparatus according to claim [67] 66, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents the mean colour texture of one or more regions in the labelled region adjacency graph.

73. (Amended) The apparatus according to claim [72] 66, wherein said plurality of stereotypes are stored in an association lookup table.

74. (Amended) The apparatus according to claim [73] 66, wherein said stereotypes are represented in an hierarchical arrangement.

76. (Amended) The apparatus according to claim [75] 66, wherein each of said stereotypes is represented by one of a plurality of icons.

77. (Amended) The apparatus according to claim [76] 66, where said digital image is stored in a database of digital images and wherein said digital image can be retrieved from said database using a keyword representing a stereotype.

78. (Amended) The apparatus according to claim [76] 66, where said digital image is stored in a database of digital images and wherein said digital image can be retrieved from said database using a icon representing a stereotype.

79. (Amended) The apparatus according to claim [76] 66, where said digital image is stored in a database of digital images and wherein said image can be retrieved from said database using either a keyword or icon representing a generalisation, or broader version, of a stereotype.

80. (Amended) A computer program product comprising a computer readable medium having a computer program recorded for classifying a digital image signal, said computer program product comprising:

segmenting module for segmenting said image into substantially homogenous regions;

processing module for processing said regions to provide a labelled region adjacency graph [providing module for providing a labelled region adjacency graph] comprising at least one semantic label and representing at least part of the digital image signal;

classification providing module for providing a plurality of stereotype classifications, for each of a plurality of patterns, wherein each said pattern comprises:

- (i) a set of labelled regions; or
- (ii) a set of labelled regions and corresponding adjacency

information; and

analysing module for analysing said labelled region adjacency graph for the presence of predetermined patterns, wherein for each pattern identified, said classification providing module provides a stereotype classification for the digital image selecting from said plurality of stereotype classifications.

Claim 81 has been canceled.

82. (Amended) The computer program product according to claim [81] 80, wherein a stereotype is assigned to the digital image signal on the basis of the semantic label content of one or more regions in the labelled region adjacency graph.

83. (Amended) The computer program product according to claim [81] 80, wherein a stereotype is assigned to the digital image signal on the basis of the adjacency of a set of regions with specified labels in the labelled region adjacency graph.

84. (Amended) The computer program product according to claim [81] 80, wherein a stereotype is assigned to the digital image signal on the basis of the size of one or more regions with a specified label in the labelled region adjacency graph.

85. (Amended) The computer program product according to claim [81] 80, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents the mean colour of one or more regions in the labelled region adjacency graph.

86. (Amended) The computer program product according to claim [81] 80, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents the mean colour texture of one or more regions in the labelled region adjacency graph.

87. (Amended) The computer program product according to claim [86] 80, wherein said plurality of stereotypes are stored in an association lookup table.

88. (Amended) The computer program product according to claim [87] 80, wherein said stereotypes are represented in an hierarchical arrangement.

90. (Amended) The computer program product according to claim [81] 80, wherein each of said stereotypes is represented by one of a plurality of icons.

91. (Amended) The computer program product according to claim [90] 80, wherein said digital image is stored in a database of digital images and wherein said digital image can be retrieved using a keyword representing a stereotype.

92. (Amended) The computer program product according to claim [90] 80, wherein said digital image is stored in a database of digital images and wherein said digital image can be retrieved using a icon representing a stereotype.

93. (Amended) The computer program product according to claim [90] 80, wherein said digital image is stored in a database of digital images and wherein said digital image can be retrieved from said database using either a keyword or icon representing a generalisation, or broader version, of a stereotype.

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